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The Royal Aero Club Gliding Competition, October 16th to October 21st, 1922.

The Meteorological Conditions.

By Captain F. ENTWISTLE, B.Sc.

THE Gliding Contest at Itford Hill, near Newhaven, for the prize of £1,000, offered by the *Daily Mail*, opened rather quietly, but the finish was as brilliant as it was unexpected when, on the last afternoon, M. Maneyrol, one of the two French competitors, wrested the world's record for gliding from Germany by remaining in the air for 3 hr. 21 min.

For some weeks prior to the contests, many people had somewhat vague ideas regarding the meteorological conditions which were necessary for soaring flight. The idea was prevalent in many quarters that the requisite condition was the development by the pilot of a miraculous " bird-sense," so that by taking momentary advantage of a gust here and a gust there he was able to keep aloft without losing height. No one who witnessed the gliding on the South Downs can doubt that skilful piloting is necessary, but, in addition to this, the first requirement is an area of persistently and steadily rising air, sufficiently strong to form an effective resistance to the descent of the machine, which would otherwise glide down to the ground at an angle depending on its design. Such conditions are found in practice in the case of a wind blowing against a ridge of hills or mountains, the mechanical effect of which is to produce an upward current which is strongest just above the crest of the ridge on its windward side. The gliding contest has made it clear that, given a sufficiently strong wind, a sufficiently stable and controllable glider

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and the right pilot, the latter can remain soaring above the ridge indefinitely, provided he remains in the upward current.

The selection of the site for the contest was made at a meeting of the Gliding Committee of the Royal Aero Club on the 14th September, at which the writer was present. Some doubt had been expressed as to the possibility of finding a suitable hill sufficiently high, having regard to the height of the Wasserkuppe, the scene of the German gliding triumphs. But there did not appear to be any reason why a hill 500 to 1,000 feet in height, provided that it was steep enough, should not give the required vertical current. The proposed site on the South Downs was favoured largely on account of its accessibility. Itford Hill had been suggested originally, with a view to gliding in a south or south-west wind; but it was pointed out, that in October, winds from north and north-east preponderate on the average.* However, as the whole ridge, parts of which face northward and north-eastward, would be available for the competition if necessary, this objection was not regarded as insurmountable. Actually north-easterly winds prevailed throughout the week of the competition, so that it became necessary to transfer the theatre of operations eastward during the week.

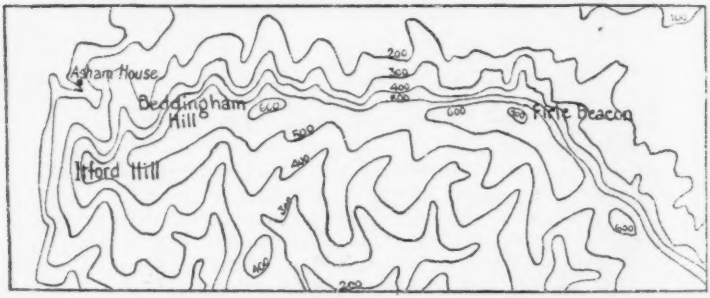
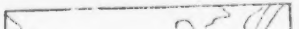


FIG. 1. The South Downs, east of the River Ouse.

The meteorological arrangements included the measurement of winds at different altitudes and the supply of this information, together with daily forecasts. Surface winds were measured by an air-meter and, in the case of the strong winds experienced during the latter half of the week, by a swinging plate anemometer. For upper winds, pilot balloons sent up from the valley were

* [This generalization is based on a discussion of the wind directions registered at Eastbourne and Brighton during the last ten years. The statement is not valid for the flow of air over south-east England as a whole. The north winds along the south coast probably represent the autumnal land breeze which prevails when the land is colder than the sea.—Cf. *M.O. Circular*, No. 42, p. 4; No. 43, p. 3; and *The Met. Mag.*, Sep. 1920, p. 177.—ED., M.M.]



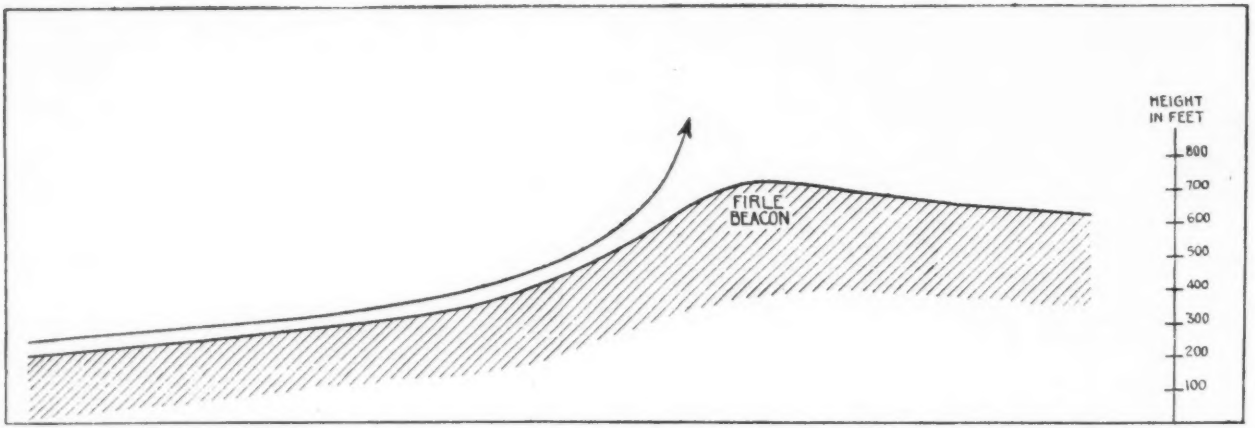


FIG. 2.—Section through Firle Beacon from north-east to south-west. Path of balloon with no " lift ".

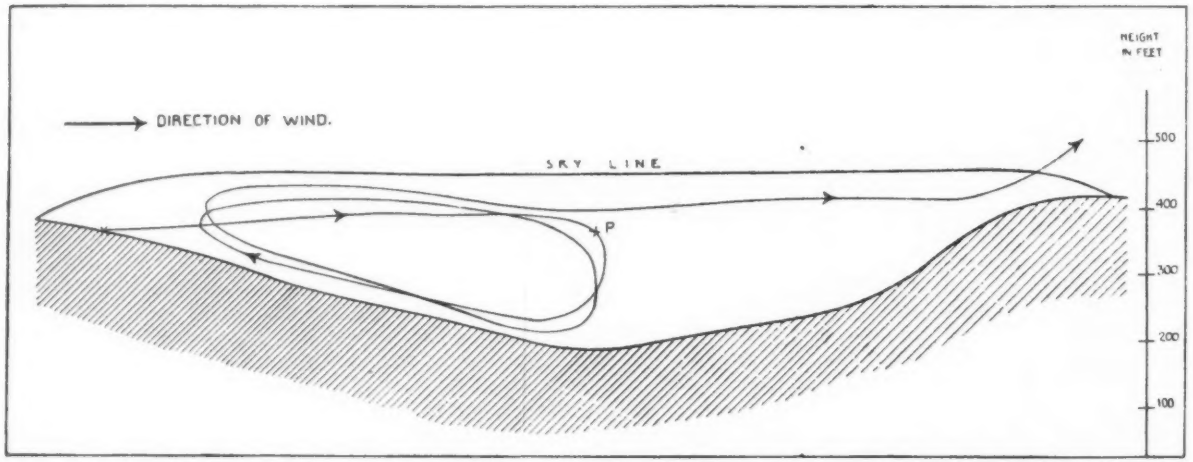


FIG. 3.—Path of a balloon with no " lift " across the valley between two spurs on the north of Itford Hill.

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followed by a single theodolite, and the direction and speed of the wind at different heights were determined by means of the "tail method," which also enabled a measure of the vertical currents to be obtained. Apart from the special merits, or demerits, of this method, it was realised that the information obtained from single ascents would not be of great immediate value owing to the configuration of the surroundings. The wind currents in the neighbourhood of the ridge were, therefore, investigated chiefly by means of free balloons having no lift, a method which had the additional advantage of giving immediate information to interested spectators.

The contour map of the trial ground (Figure 1) shows that the northern side, which extends from Itford Hill to Firle Beacon, the highest point of the ridge, is very steep. Spurs jut out from it northwards forming a series of short, cup-shaped valleys. On the other side of Firle Beacon the ridge runs from north-west to south-east and the north-east flank is less irregular.

The result obtained from a balloon in the normal case of a north-east wind blowing at right angles to the hill is shown in Figure 2, which represents a section through Firle Beacon from north-east to south-west, drawn to scale. The upward current referred to previously is shown very clearly.

In the case of a north-east wind, very curious effects were observed in valleys on the north side of the ridge. Figure 3 represents a section across the first valley, just below Itford Hill. The section is not taken parallel to the ridge, indicated by the words "sky line" in the diagram. Roughly speaking, the sky line runs east and west, the section north-east and south-west. A balloon was liberated from the top of the eastern spur so that it would travel across the valley. Another balloon, released previously farther from the ridge, at the bottom of the spur, followed closely the contours of the ground, a result found almost invariably during the week in the case of small slopes. But the second balloon moved in the direction of the wind to a point *P* in the centre of the hollow, where it remained stationary for several seconds. It then descended and came back up the leeward slope of the spur practically to the point of departure. This circuit was completed a second time, after which the balloon rose rather higher than before and was carried across the valley, rising over the top of the western spur and finally descending behind the ridge. Similar eddy effects were observed in the other valleys. At least two competitors came to grief through gliding from the western edges of these valleys; starting places could be found where the wind blew straight up the slopes, but the eddies in the valley made gliding hazardous. It was not surprising that most pilots preferred to take their machines to the other side of Firle Beacon, where the wind was normal to the ridge. This area, however, was not without its pitfalls. A

short spur runs north-eastward from Firle Beacon where the ridge bends, and balloons liberated from the two sides of this spur travelled upwards in different directions, revealing a distinct "air-parting." It was, therefore, desirable to avoid the edge of the ridge when gliding.

The results obtained during the week point to the fact that for successful soaring flight, the ideal conditions are a straight or slightly concave ridge and a fairly strong, steady wind blowing at right angles to it. The slope of the ridge on the windward side is of greater importance than its height. The actual strength of wind required depends, of course, on the type of machine used.

Another point which has been overlooked is that the strength of the ascending current, the production of which is largely mechanical, depends to some extent on the prevailing atmospheric conditions, particularly the vertical temperature gradient. If the lapse rate is large and convection is going on freely, the vertical current will be reinforced. This was observed during the flight of M. Maneyrol, the winning pilot, on the afternoon of the 21st. Heavy banks of cumulus and cumulo-nimbus cloud, which followed one another in quick succession from the north-east, were evidence of strong convectional circulation. The glider was observed to rise appreciably as these passed overhead.

This new branch of aeronautics has opened up an interesting and important field of investigation, fascinating alike to the meteorologist and to the aviator, in which little has hitherto been done.

OFFICIAL NOTICES.

A New Anemograph Station at Aberdeen.

THE new anemograph station at Aberdeen is situated in an open field due east of the Observatory and about a quarter of a mile distant from it. The exposure is, therefore, less gusty than that of the Robinson anemometer, which is erected on top of the Observatory and surrounded by the buildings of King's College and the neighbouring part of the town.

The hut is erected within an enclosure measuring 60 ft. by 50 ft., with an 8 ft. corrugated iron fence around it; the vane is roughly 40 feet above the ground. The ground slopes downward from north to south, and very gently downward both to east and to west. In the north-east corner of the enclosure a small platform has been erected around a concrete pillar; the top of the pillar is about 9 feet above the ground, and carries the "wall-head" for the Watts Theodolite. A clear view all round is thus obtained which will be advantageous for pilot-balloon work.

The Estimation of Cloud Amount on Days of Fog or Mist.

THE problem how fog and mist are to be allowed for in arriving at estimates of cloud amount is a difficult one. We know that the condition most favourable for the formation of fog is the presence of a clear sky overhead, and in fact it often happens that an observer who is himself immersed in a fog can see through it and realise that there is bright sunshine a few feet above his head. Another recurring problem is offered by the day when the sky is covered by a thin veil of cloud which may perhaps be manifest only by the halo. Are the cloud amounts 0 or 10?

Experience has shown that the instructions hitherto given for the guidance of observers needed to be amplified, and the following rules have been adopted at the telegraphic reporting stations and observatories of the Meteorological Office, with a view to their incorporation in due course in official books of instructions to observers :—

Entry of Cloud on occasions of Fog or Mist.—If the vertical thickness of the fog is so great that it is impossible to tell whether there is cloud above it or no, the cloud amount should be entered as 10. This applies, for example, to all cases of fog in the daytime in which the sun is *quite* invisible. If cloud can be seen through the fog, then the amount should be estimated as well as possible and entered in the ordinary way. The form can also be recognised under these conditions more or less correctly and should be noted. If the sun or stars can be seen through the fog and there is no evidence of cloud above the fog, the amount of cloud should be entered as 0, irrespective of the *horizontal* thickness of the fog.

Very thin clouds.—It is to be noted that the "amount" of cloud under existing international practice has no relation to the thickness of the cloud. If therefore an observer can be sure from any sign in the sky that the air contains condensed water (or ice) the proportion of the sky covered by this cloud should be estimated.

State of the Ground.

OBSERVATIONS of the state of the ground are now taken at the four regular daily hours of observation used for telegraphic reports at the Observatories and Distributive Stations of the Meteorological Office. A figure code running from 0 to 9 enables the primary characteristic of the state of the ground to be reported by telegraph. Thus it is indicated whether the ground is dry or wet, frozen or covered with snow. If there is skating or there are glazed roads, this can be reported. The observations made at 1 p.m. have been published in the *Daily Weather Report* from the 1st of November.

Discussions at the Meteorological Office.

October 30th, 1922. *Wet Bulb Temperatures and the Thermodynamics of the Air.* By C. W. B. Normand (Memoirs of the Indian Meteorological Department. Vol. 33, Part 1, 1921, pp. 1–21). Opener—The Author.

AT the meeting on October 30th, the Meteorological Office welcomed Dr. Normand, on leave from Simla, who gave an account of his own work on thermo-dynamics.

As was brought out in the course of this discussion the term wet-bulb temperature is very ambiguous. For the purpose of this summary it seems better to utilise the term adiabatic saturation temperature, which may be defined as follows:—

Given air in a certain state and water at a certain temperature such that the cooling of the air to that temperature would provide the heat necessary to evaporate sufficient water to saturate the air, the total pressure remaining constant, the temperature in question is the adiabatic saturation temperature of the air. The abbreviation A.S. temperature will be used.

Dr. Normand would take the wet bulb temperature obtained with forced ventilation as equivalent to the A.S. temperature. Subsequent speakers regarded the approximate identity as more or less accidental, basing their opinion on the results of experiments* with liquids other than water and gases other than air.

The central ideas of Dr. Normand's paper are stated most readily in terms of the Neuhoff diagram. It appears that when air is moved from one level to another, the A.S. temperature follows the adiabatics for saturated air, and this regardless of of whether condensation or evaporation is taking place, the only condition being the absence of effective radiation and exchange of heat with other air masses.

A striking example of the use of the theory in testing the homogeneity of air may be quoted. Many observers have noted the increase in temperature and fall in humidity in the interior of tropical cyclones; in such circumstances we should expect to find almost adiabatic conditions and constant wet bulb temperature. The observations of the temperature and humidity on the occasion of the Manila typhoon, October 20th, 1882, were examined to see if this were correct, and it was found that, though the dry bulb temperature rose 7·8° F. and the humidity fell from 100 per cent. to 50 per cent., the variation to the wet bulb temperature amounted to a fall of only 0·4° F.

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* Cf. *Zur Kenntniss des Ventilierten Psychrometers.* By A. Svensson. Akad. Abh. Stockholm, 1898.

Potential A.S. temperature may be defined as the A.S. temperature which would be assumed by the air (with any vapour and liquid water it contains) if it were brought adiabatically to standard pressure. To a close approximation, potential A.S. temperature is an invariant in adiabatic changes even when the liquid water is precipitated. It follows that to the same order of approximation, the entropy of the air is a function of its potential A.S. temperature. The potential A.S. temperature of the atmosphere increases with increasing height in temperate regions, but decreases in the tropics, and a like generalization therefore applies to entropy.

Such statements have to be interpreted with great care, however. Sir Napier Shaw gave it as the result of his experience that the safest course was to regard the dry air as the "working substance" in thermo-dynamical processes and to regard the moisture contained in it as a source of heat by which entropy would be increased on condensation. Allowance could be made for the effect of the moisture on the density, but, if that were omitted, the results were still sufficiently accurate for working purposes.

An account of the discussion on October 16th of Prof. V. Bjerknes's paper *On the Dynamics of the Circular Vortex*, which was opened by Sir Napier Shaw, will be published in the next issue of this magazine.

The subject for discussion on Monday, November 27th, 1922, at 5 p.m., will be: *Die Zirkulation der Atmosphäre in den gemässigten Breiten der Erde.* (The Circulation of the Atmosphere in the Temperate Latitudes of the Earth). By A. Defant. Stockholm. *Geog. Ann.*, III., 1921, pp. 209-66. The discussion will be opened by Mr. R. G. K. Lempfert.

Correspondence.

To the Editors, *The Meteorological Magazine.*

Change of Wind on the Turn of the Tide.

APROPOS of Capt. Hepworth's suggestion that the weather changes with the turn of the tide, to which I referred in a note on *Weather Lore* in the February Number of this magazine, my attention has been called by Dr. C. F. Brooks to two short articles on the subject by Mr. H. M. Plummer in the *Bulletin of the American Meteorological Society*, Oct.–Nov. 1921, and March, 1922.

In the first note Mr. Plummer asks for an explanation of the sudden increase of south-west wind on the turn of the tide which he has observed on many occasions on the southern coast of New England between Point Judith and Monomoy Point.

He notices that the phenomenon is especially frequent in spring and most marked between 8 a.m. and 3 p.m. It is always preceded by a calm, with warm sun, and may be repeated for many days in succession, an hour later each day, and with the wind daily decreasing in violence; it does not occur in winter nor at night nor in cloudy weather, but may occur during fog. Mr. Plummer notes also that it is the south-west wind alone which occurs on the turn of the tide and that it comes only at the beginning of the ebb or western tide.

In the second article Mr. Plummer himself suggests an explanation, namely that at night a layer of cold air forms at the surface of the sea; the wind, which rises during the day, flows over the top of this cold layer and, aided by the sun's radiation, gradually wears away the layer and also sets it in motion. If the tide be running in the same direction it will set the cold air in motion at the surface and when the tide turns, this motion at the surface is checked and in consequence becomes turbulent; the thin cold layer of air is blown away, and the wind establishes itself at the surface.

NAPIER SHAW.

Nov. 4th, 1922.

North-East Wind, but Squally Weather.

WEATHER sufficiently rare to seem worthy of special note was experienced at Cranwell, Lincolnshire, during October 18th and 19th.

The isobaric distribution on the 7 h. map of the 18th showed an extensive anticyclone centered over Scandinavia, the isobars over the British Isles being of anticyclonic curvature. The same isobaric distribution was shown by the 7 h. synoptic map on the 19th and the curvature of the isobars over these Islands still remained anticyclonic.

During the two days in question, the feature of the weather at Cranwell was the succession of heavy showers. Each shower was accompanied by a squall, the wind, as registered at 43 feet above the ground, rising from the general mean, between 10 and 15 miles per hour, up to 25 or 30 miles per hour. Each squall was accompanied by a rapid backing of the wind from the general mean of ENE or NE to N or even NNW, the backing only lasting for a minute or so. Each squall, too, was accompanied by an arch of cloud, cumulo-nimbus or nimbus in type, which bore a marked resemblance to the cloud formation accompanying line-squalls, and the precipitation was heavy rain or sometimes rain with a little hail. At least 15 such showers occurred in the two days.

The showers were travelling from east to west and the peculiarity of the phenomena seems to me to lie in that east-to-

west motion. It might be explained by the passage of small cyclonic sinuosities round the southern side of the anticyclone moving from east to west. In any case I do not remember ever having noticed the same thing—the travel of so many squalls from an easterly to westerly point in conjunction with such a pressure distribution—and it would be interesting to know if such weather was really unique. Happily in this case the appearance of the sky, coupled with reports of extreme bumpiness from air-pilots, enabled the showers to be forecasted correctly, though the map might not have led one to suppose them so certain.

W. H. PICK.

October 23rd, 1922.

The situation described by Captain Pick may be summed up by saying that the weather was of a north-westerly type (squalls and showers), while the wind was easterly. The north-westerly type gets its features from the fact that cold polar air has passed over a long stretch of warm sea on its way to these shores. If air from the Spitzbergen neighbourhood comes down to us over the Baltic and North Sea there seems no reason why, at this time of the year, it should not get the same features as north-westerly air and this is probably what happened on October 18th and 19th. The difference is that, whereas north-westerly air from polar regions is bound to come over a warm sea area before reaching us, it requires a very nice adjustment in the case of air reaching us from polar regions via an easterly course.

J. S. DINES.

October 26th, 1922.

Shallow Winds.

WITH reference to Mr. H. Harries's letter on shallow east winds, may I recall a remarkable case of a shallow wind which I experienced on July 23rd, 1911? I was sailing eastward from Helford to Fowey on that day; at one time, when about four or five miles off the coast we were on the starboard tack with a southerly wind, and making, to the best of my recollection, three to four knots; about a couple of miles nearer the shore the yacht *Laverock* was sailing at about the same pace, but she was on the port tack with a northerly wind. As far as I remember these conditions persisted for about an hour; at one time while we were on the starboard tack I made out thistledown overhead coming from the north. Our southerly wind died away gradually, but before it dropped entirely, and while the sails were still drawing, the burgee at the mast head, about 75 feet above the deck, was in a very light northerly breeze.

C. J. P. CAVE.

Stoner Hill, Petersfield, October 20th, 1922.

Cloudbands and Wind Forecasts.

WITH reference to the fan-like appearance of parallel cloud bands in the sky, Mr. W. F. Dale writes as follows :—

"It is thirty years ago, when I was living in the Falklands, that I first came to connect the fans with a change of wind. I thought at that time the phenomenon might be peculiar to the southern hemisphere; but when I came back to England I found just the same thing here. My observation, extended over this number of years, would lead me to say without any hesitation that the appearance of two opposite 'fans' indicates a change of wind, and that within 24 (or 36) hours the wind will be coming from the quarter occupied by the second fan, *i.e.*, it will be blowing from the quarter opposite to the wind which prevails when the fans appear. The reasons I have not spoken about this (shall I call it discovery?) before, are two—first, I thought it had probably been noted 'since Adam threw away the core,' and, second, because it apparently failed occasionally say, once in five or six times. But further observation has convinced me that what happens in the apparent failures is that the new wind is not sufficiently strong to overcome the prevailing wind and after, perhaps, bringing about a calm or a drift of smoke from the chimneys in the opposite direction for an hour or so, the prevailing wind resumes its sway. . . . I would say that the fans always indicate a change of wind. I would *not* say that a change of wind is always indicated by fans, though they may perhaps be sometimes hidden by a lower stratum of clouds. . . . To be of much practical use the study of this phenomenon should enable the skipper of a ship to determine from the look of the fans what the *force* of the new wind may be expected to be and to say to the first mate: 'Those are good fans, now we shall be all about!'

May I suggest that there is a case for inquiry?"

WALTER F. DALE.

"Minerva," Upper Parkstone, Dorset, October 25th, 1922.

Seasonal Variation of East Wind: A Correction.

IN my letter on this subject in the October number of *The Meteorological Magazine* the point of my argument was nullified in the unfortunate printing of *unheated* where I had written *sun-heated*. My point was that the continental mainland warms up so rapidly that by May easterly currents tend to reach south-east England as warm land winds, unless they have a decided northerly component. We know that the continent often becomes highly heated in May.

L. C. W. BONACINA.

27, Tanza Road, Hampstead, N.W.3, October 18th, 1922.

A Persistent Rainbow: Porlock, September 16th, 1922.

ON the afternoon of September 16th, whilst driving over Dunkery Beacon, I witnessed an unusual rainbow effect. Up on the Beacon a thick Scotch mist prevailed, but as the conveyance descended the hillside towards Porlock the mist lifted somewhat and, looking in the direction of Porlock (north-east), the hillside near Hurlstone Point was seen to be bathed in sunshine, causing the grass slopes to appear a very vivid green. Superimposed upon this brilliant scene was a magnificent rainbow, which remained visible for nearly an hour and a half. The sky was about nine-tenths covered with cloud and the clear patch through which the sun was able to light up the hillside remained in practically the same position throughout. I should imagine that the rainbow was formed by a very fine drizzle, as the arc was large and covered the entire hillside. Moreover, I viewed the bow from a great elevation (almost 1,000 ft. at first) and the bow was still visible when I reached the valley. The colours of the bow were all present, but were not sharply defined. The effect was " smudgy " or blurred, the colours appearing to run into each other. The points that were most striking were the intensely vivid, bright green of the hill sides contrasting with the colours of the bow and the clear patch of blue sky practically stationary, the rest of the sky, low driving fracto-status.

F. J. PARSONS.

County Observatory, Ross-on-Wye, October 25th, 1922.

THE Porlock Valley runs inland from the British Channel towards east-south-east, the Exmoor hills, 1,000 ft. and upwards on one side, Bossington Hill, about 700 ft. on the other. Throughout the day in question, September 16th, 1922, the general flow of air, as shown in the *Daily Weather Report* maps, was from south-south-west. The persistent patch of clear sky over the valley seems to be explained by the descent of the air from Exmoor. On the other hand, the drizzle-producing cloud over Bossington Hill may have been fed by the damper air coming up the valley from Porlock, this damp air being scooped up by the upper current. It is remarkable that the conditions should have been so stable as to give such a persistent rainbow. The smudginess of the bow indicates very small rain-drops.

Such an explanation as has been given of this distribution of cloud seems to be necessary in the case of the " Helm Bar." The Helm Bar* is frequently seen in the Eden Valley when an east wind blows across the Pennine Range in the neighbourhood of Cross Fell. The Range is covered by the Helm Cloud and, at a distance of a mile or two and at a lower level, the Helm Bar

* See *Q.J.R. Met. Soc.*, 1889. Vol. XV., p. 103.

is formed. The Bar is stationary, being continually reinforced by condensation on the windward side. It seems clear that the moisture evaporating at the base of the Helm Cloud could not condense again at a lower level and that the existence of another source of air supply must be a necessary condition for the phenomenon. The known distribution of wind near the ground is consistent with this theory. F. J. W. W.

November 2nd, 1922.

The Red Rainbows of July 30th, 1922.

ON turning up my own observations for July 30th I find :—" Red rainbow, faint. Strong fiery glow on clouds in SW-NW. Bow all red, only faint trace of green." It was the conjunction of a strong sunset glow and a shower which led me to look for the bow. The time was after church on the Sunday evening, July 30th, I believe about the time Mr. Harries saw his bow.

CICELY M. BOTLEY.

10, *Wellington Road, Hastings, October 19th,* 1922.

The Green Flash.

IN August the sun sets into the sea at Bude. On August 23rd, 1922, a remarkably clear and beautiful sunset took place, and with a pair of field-glasses (which it is quite safe to use when the sun is really low on the horizon) the green flash was clearly seen, though observers with the naked eye told me they failed to see it. What was remarkable was that the arc of the sun turned green, and then also the chord made by the sea horizon, and for a fraction of a minute these two lines enclosed an orange space. This rapidly disappeared and the last segment was wholly green. I do not remember to have seen any description of such a flash before, but I think if observers would use glasses the green flash would much more frequently be recorded.

AGNES FRY.

Failand House, Bristol, October, 1922.

Earwigs and Recording Instruments.

I HAVE a Yale lock on my thermometer screen and for a time I was much annoyed by earwigs getting into the lock; they had the habit of dropping up my coat sleeve when unlocking. A drop or two of paraffin squirted into the lock has been most effective in keeping the lock clear—most instruments could be wiped round with a paraffin cloth. I have noticed that leaving one or two killed earwigs in the outer part of the rain-gauge seems effectively to keep others from intrusion.

CHAS. HARDING.

2, *Bakewell Road, Eastbourne, October 6th,* 1922.

NOTES AND QUERIES.

An Eighteenth Century Meteorological Diary.

IT is always instructive to peruse early records of scientific work, but old meteorological diaries seem to possess a particularly personal interest, especially when they contain the results of observations made by one individual throughout a long lifetime. Such a record has recently been lent to the Meteorological Office by the Provost and Fellows of Lancing College and a summary of the manuscript books is now available in the Library of the Office.

This record is contained in two small manuscript volumes which represents the observations of a lifetime and give a diary of meteorological events extending over nearly 63 years, from 1733 to 1795.

The diarist, Thomas Barker, was born at Lyndon, in the county of Rutland, in 1722, and resided there until his death in 1809. He was a well-known and assiduous observer of meteorological phenomena and among his contributions to the Royal Society is a series of annual summaries of his observations at Lyndon. These summaries date from 1771 until a few years before Barker's death. Other papers from his pen will be found in the early *Philosophical Transactions of the Royal Society*, one of them dealing with the rainfall of the Lyndon district.

The two volumes of records are of different character. The first, which deals only with the period 1748 to 1763, contains both instrumental and eye-observations for each day of the year. Generally speaking, the instruments, barometer, thermometer and rain-gauge, were read twice daily at about 8 a.m. and 3 p.m. Barker did not always restrict himself to two observations *per diem*, but sometimes, when he thought the weather to be of particular interest, made several readings a day. Accompanying the instrumental readings are notes of wind force and direction, cloud velocity and direction, and present weather. To specify wind force a numerical scale is used, and a similar scale is employed to denote cloud velocity. The weather notes are full, and a brief monthly summary is given at the end of each month's observations.

The second volume contains only incidental references to instrumental observations. It consists of a continuous narrative of the weather from 1733 to 1795 and is written from the point of view of a farmer. The weather is described with particular reference to the yield of the staple crops and to the operations of seed time and harvest. Prices of the chief cereals are given frequently and details are mentioned of the effects of the weather on the rearing and health of farm stock. In addition, phenomena

which seemed to Barker to be of outstanding meteorological interest are fully described, and a number of these formed the subjects of notices to the *Philosophical Transactions of the Royal Society*. The whole volume forms a most interesting record of agricultural meteorology.

C. E. BRITTON.

The Storm of March 4th, 1818.

CAPTAIN J. B. HEWETT writes:—

> "I WAS interested to observe the inscription '4th March 1818 Strong Wind' deeply carved in one of the stout oak beams of an ancient windmill at Bodle Street, a small hamlet about 9 miles north of Eastbourne in Sussex. . . . It occurred to me that a 'Strong Wind' which created in the mind of a man to whom observations of wind vagaries must have been a second nature, the desire to record the event in such a manner, must have been something extraordinary in the way of strong winds."

Reference to contemporary records, chiefly manuscript diaries in the possession of the Royal Meteorological Society, shows that the storm was very violent in the neighbourhood of London and at Boston, Lincs. J. W. G. Gutch in his list* of "Some of the remarkable meteorological phenomena that have occurred during the last thousand years" says:—

> "1818, March 4th. A tremendous hurricane throughout England, doing vast damage to the shipping."

Bellville in his excellent diary kept at Greenwich, says:—

> "About 8 o'clock p.m. [March 4th] a furious tempest began such as has not been known for many years—and lasted till midnight, great Elms in the park were torn up by the roots, many houses in the metropolis were completely levelled with the ground and many serious accidents followed, several lives lost and the damage at sea beyond description here. The tempest came from the South accompanied with much and continued rain and a great deal of lightning towards the close, the Bar. fell to 28·41 during the storm."

The Journal of the Royal Society has this remark against March 5th:—

> "Fair. A violent gale between 10 and 12 last night; baro. 28·6 at 11h. 30m."

* *Quarterly Journal of Meteorology*, Vol. 1., 1843, p. 134.

While the Reverend James Cowe in his diary kept at Sunbury Vicarage, Middlesex, records that March 4th was "*Very* stormy."

The diary kept by a Mr. C. Soare, of London, is of special interest as he gives the barometric curves for each month; March shows a series of depressions, the storm of March 4th, 1818, giving the lowest reading, about 28·4 inches. His comment on the storm is:—

> "Forenoon fine, at 3 p.m. the Mercury began to descend, and at 11 p.m. it had fell 8½ degrees [*sic*] more than 1 for each hour, a complete hurricane from 7 to 10 at night attended occasionally with rain—and very bright all night and till noon."

Another Journal with copious remarks is that kept by Mr. Edwin at Clerkenwell. His entries for March 4th and 5th are:—

> "March 4th. Wind particularly violent, a perfect hurricane for about ½ hour . . . red flashes but not frequent . . . tiles fell off the houses in every direction.
>
> "March 5th. The newspapers this morning give a long account of the damage done by the Hurricane on Wednesday night . . . it blew in the roof of Surgeons' Hall in Lincoln's Inn Fields, a piece of lead about 2 cwt. also tore up a large tree by the roots in the square."

Luke Howard, in his *Climate of London*, against his own observations at Tottenham on March 4th, writes:—

> "Fine morning; the barometer which had gone somewhat lower rising abruptly; having risen about four-tenths, it took to falling again rapidly, there was a completely overcast sky (with haze in broad streaks, converging in the south-west, and moving swiftly under it) till dark; when it began to rain and the wind rose to a greater degree of violence than for some years past, ranging thus from south-east to south-west till past midnight; when it abated the barometer appears to have turned to rise more abruptly than before, having gone down an inch in 15 hours (the actual lowest point 28·35): there is said to have been much thunder and lightning after midnight; the barometer fell, not uniformly, but by fits, at intervals of about a quarter of a minute, as the more violent gusts of winds came over."

At Walthamstow he records:—

> "Very fine day, night violently stormy; wind and rain; lightning about midnight; then stars appear and aurora borealis."

And Mr. Cary, of the Strand, whose tables are incorporated in the *Climate of London*, remarks:—

> "March 4th, cloudy in the evening. The barometer fell to 28·55 and a violent storm succeeded."

The Boston journal referred to above records "a hurricane at night" on March 4th and "Rain and hail, heavy fall of snow" on the 5th.

The Total Eclipse of the Sun on September 21st, 1922.

SUCCESSFUL observation and photographing of eclipse phenomena depend entirely on favourable weather conditions.

On the morning of September 21st the sun was totally eclipsed on a narrow belt of the earth stretching from Somaliland across the Indian Ocean and Australia. Expeditions were made to most of the accessible stations on the track, including one from Greenwich to Christmas Island, which like Wallal, on the north-west coast of Australia, was a most favourable spot for observations on account of the high altitude of the sun. The principal purpose of the expeditions was the verification, by means of photographs, of the bending of the path of a ray of light in its passage through the sun's gravitational field, in accordance with Einstein's theory of relativity.

Reports from Wallal, Adelaide and Central Australia are very satisfactory, as ideal weather conditions prevailed; and results of great importance are expected. The weather at Christmas Island, however, was very cloudy so that only a corona photograph could be taken. Conditions were also not very favourable at Goondiwindi in Queensland.

The Experimental Study of the Propagation of Sound.

The Explosion of October 28th, 1922.

THE proposal by the Dutch Ministry of War to arrange an explosion in order that the propagation of sound might be studied was noted in the last number of *The Meteorological Magazine*. It was thought that, owing to some opposition from people living near the place of explosion, the experiment would have to be deferred. But the matter was arranged satisfactorily and at 17h. G.M.T. on October 28th the explosion of five tons of ammonium perchlorate took place at Oldebroek, a village in Gelderland 10 miles west-south-west of Zwolle (long. 5° 59′ 40″ E, lat. 52° 29′ 56″ N).

In this country arrangements were made by the Meteorological Office for the observers at all the observatories and reporting

stations to listen for the sound and to make notes regarding the meteorological conditions at the time. Where possible, observations of wind and temperature in the upper air were also made. In addition, a note was issued to the press inviting the public to forward to the Meteorological Office any notes of observations made; some indication of the type of observation which would prove most useful was also given.

Over a hundred reports have been received up to the present. The most distant points at which the explosion is alleged to have been heard are North Wales and Northumberland. Two valuable records have been obtained on the hot wire microphones of the Signals Experimental Establishment, at Woolwich and at Biggin Hill, Kent, respectively. As soon as the British observations have been examined and summarised the results will be forwarded to the Dutch Meteorological Service for collation with Continental reports. It is hoped that some account of the results will be published in this magazine at a later date.

Daily Charts of the Northern Hemisphere.

THE reports now being received daily in this country from American stations by wireless telegraphy as noted in the July magazine enable charts of pressure and wind for a considerable portion of the Northern Hemisphere to be prepared in the Forecast Service each day. Such charts are now exhibited in a ground-floor window in the Air Ministry, Kingsway, adjoining that where the large blackboard map of weather conditions in north-west Europe is shown. The Northern Hemisphere weather charts cover an area extending roughly over the Temperate zone from the Pacific coast of America in the west to the western borders of Asia in the east.

It will be seen that, except for the absence of Siberian observations, the area covered by the new charts is practically the same as used to be shown in the *Weekly Weather Report*, Section 2.—Daily Synoptic Charts of the Greater Part of the Northern Hemisphere. Those charts were largely based on the printed reports for the same countries and appeared two weeks after date. Publication was suspended at the beginning of the war, and for reasons of economy it has not been resumed.

Meteorological Stations in the Arctic Circle.

AN interesting article on *Meteorology of To-Day* was printed in *The Times* of September 21st. It described how Professor V. Bjerknes and his collaborators are endeavouring to establish a chain of stations round the Pole in order to study

the movement of the polar current and to ascertain the centres of its conflict with the opposing equatorial current. A series of stations in this region will have practical as well as theoretical significance, since regular forecasts for the North Atlantic will be required when the Transatlantic air-route is in daily use. Observations from more than one station in Spitzbergen have been available for some time; and since October, 1921, wireless weather messages have been sent out six times a day from the station at Jan Mayen, which was established after considerable difficulties by Ekerold and his party. The observations are published in the International Section of the *Daily Weather Report*. On several occasions, warnings of approaching storms sent out from Jan Mayen have averted much damage to Scandinavian shipping. Mr. Ekerold is now proposing to establish a third station on Baffin Island in Davis Strait, near to western Greenland. It will be over a thousand miles from any existing station. Professor Bjerknes considers that a station in this position will add greatly to our knowledge of circumpolar climatology and will prove of the utmost value for Atlantic forecasts. Moreover, Dr. Nansen is of the opinion that the observations of barometric pressure on Baffin Island will be of great importance in the prediction of the Atlantic ice-drift.

It is to be hoped that Ekerold will secure sufficient support to enable him to carry out his project. His pioneer work in Jan Mayen has been of value to the weather service of this country as well as to that of Norway.

Reports from Greenland.

SINCE October 28th, reports have been received by wireless telegraphy from Mygbugten, situated on the east coast of Greenland, in latitude 73° 30′ N. These observations are due to the enterprise of the Norwegian Meteorological Service, which has taken advantage of the despatch of a hunting expedition to the eastern coast of Greenland, to set up a meteorological station in that inhospitable region. It is understood that the reports from Mygbugten are despatched by wireless to Jan Mayen and from there to Norway. They are issued in the collective message from Christiania and so are available to all European countries. The station forms a valuable addition to the existing northern network which previously consisted of Spitzbergen, Bear Island, Jan Mayen and the stations in Iceland, so that the pressure changes which occur in these northern regions between longitudes 30° E and 30° W can now be studied from day to day in considerable detail.

Instruments for the Study of Atmospheric Pollution.

A PAMPHLET bearing the title *Instruments for Measuring and Recording the Quantity of Smoke and Dust Pollution in the Atmosphere* has recently been issued by Messrs. C. F. Casella and Co. The instruments described are those designed by Dr. J. S. Owens and adopted by the Advisory Committee on Atmospheric Pollution. The Automatic Air-Filter, which serves to give a record, practically continuous, of the changes in the amount of dirt in the air, is described and illustrated, and full instructions for its manipulation are given. The ingenuity shown in this apparatus, in which the ordinary water supply is used both for pumping the air and for controlling the movement of the recording apparatus, is remarkable. Equally original ideas are incorporated in Dr. Owens's apparatus for dust examination. The use of a humidifier (a tube lined with wet blotting paper) to ensure that all the dirt particles shall act as centres of condensation is a case in point. The air is being sucked through a narrow passage so as to impinge on a glass plate (a microscope cover-glass), and it is necessary to catch all the dirt particles on the plate. There is slight cooling of the air by expansion and therefore with saturated air the particles carry moisture and stick to the plate. Casella's pamphlet contains telling reproductions of photo-micrographs obtained from Dr. Owens's records. The apparatus should prove of use in the investigation of the conditions which prevail in factories and other places where the air is impure. For the purpose for which it was designed—the investigation of the nature of the dust in the free atmosphere—it is invaluable.

Toy Balloon "Races" from Brighton.

DURING the summer months of this year toy balloon "races" were arranged at Brighton by Major J. M. MacLulish. Attached to each balloon was a numbered postcard to be returned with place and time of finding. Prizes were awarded for long distance flights and the finders were rewarded. The "races" were at first merely an amusement, but Mr. H. Harries has interested himself in the scheme and at his suggestion the dating and timing of the departure of the balloons was adopted so that an investigation of the returned cards may yield some interesting information. Several long distance flights were recorded, the longest being 460 miles; the course on that occasion was S 77° E and the balloon reached Greding, in Bavaria.

It may be noted here that all pilot balloons sent up from official meteorological stations in this country have labels attached which, it is requested, should be returned by the finders.

Obituary.

Stefan C. Hepites.—We regret to learn of the death, at Braila, on September 15th, 1922, aged 71 years, of Doctor Stefan C. Hepites, formerly Director of the Central Meteorological Institute of Roumania. Doctor Hepites was educated as an engineer and early became interested in meteorology: in 1878 he installed a station at Braila. Owing largely to his influence, other stations began to appear, and their observations were published by the Academic Society of Roumania. In 1883 Doctor Hepites was commissioned by the Department of Home Affairs to study the organization of Meteorological Services in Europe, and his report resulted in the formation, in April, 1884, of the Central Meteorological Institute of Roumania, of which he was the first Director.

Under his energetic leadership the Institute maintained an active existence, and issued, besides the *Analele* and the *Buletinul Lunar*, a number of valuable memoirs, most of which were prepared by Hepites himself. Special reference may be made to the *Album Climatologique de Roumanie* and the *Régime Pluviométrique de Roumanie*, both published in 1900. Between 1894 and 1907 appeared his *Materials for the Climatology of Roumania*, a series of twenty-five monographs. In 1895 the Roumanian Daily Weather Report made its first appearance, and in 1903 a Seismological Service was established.

Doctor Hepites resigned the active administration of the Meteorological Institute on April 14th, 1907, when he was succeeded by J. St. Murat, but he retained the title of Honorary Director. In 1908, when the Meteorological Institute was incorporated with an Astronomical Service under the title "Astronomical and Meteorological Observatory," his official connection with the service ceased, but he continued to take an active interest in the meteorological work of his native country, and in the re-organization which has been rendered necessary by the War his advice will be greatly missed.

Doctor Hepites was a member of the International Meteorological Committee from 1891 to 1908.

Reviews.

Earthquakes in Jamaica from 1688 to 1919. By MAXWELL HALL, M.A., F.R.A.S., F.R.Met.Soc., Government Meteorologist. 13 × 8, pp. 58. Illus. Jamaica: Government Printing Office, Kingston, 1922.

MODERN seismologists have shown a tendency to ignore the actual earthquake shock except as a means of setting up a variety of waves in the substance of the earth. The detection and measurement of these waves have occupied the experi-

mentalist and their interpretation in terms of the physical properties of the earth has attracted the mathematician.

By the very remarkable facts he brings forward in his study of earthquakes in Jamaica, Mr. Maxwell Hall recalls attention to the origin of earthquakes. One half of the paper is a register of quakes felt in Jamaica from 1668 to 1919. Information has been more plentiful since 1880, when the weather service was started. It is found that of the 700 shocks recorded since 1880, all but 16 can be ascribed to 16 epicentres, distributed throughout the island (or in the adjacent seas), and that each of these epicentres has its own period. The periods for the different epicentres are from 9 to 31 days. The relation between the dates of the various shocks of a series may be stated in the form $D = E + nP$, E being the date of the first shock noted, D the date of a subsequent shock, P the period and n an integer. There are complications, however: (1) n does not increase regularly by unity; shocks may occur regularly for two or three periods and then miss a hundred. (2) The period of an epicentre may undergo a change after a shock, the series then continuing with a new period. Ten such changes of period are noted. (3) While the main series of shocks flows on regularly, two or more shocks may occur with correct intervals of nP between them, but at dates which do not agree with the primary series, so that short intervening series are found. Thirteen such short series are given.

No difference greater than two days occurs between the actual recorded time of a shock and the computed time. This means that in the longer series, where n sometimes exceeds 1,000, the period must be determined to within a few minutes!

In fifteen short and tantalising paragraphs Mr. Hall discusses these important results, sets out the earthquake frequency for each year, month and hour, makes suggestions as to the effect of meteorological elements and gives good reasons for assuming a variation in the depth of the epicentres with time. Such restraint in the presence of results which open floods of speculative thought must be admired and one can only express the deepest regret that Mr. Hall's death has forestalled the possibility of his dealing with the new material which must be produced by the application of these methods to other parts of the world, especially those where local epicentres are less numerous.

The study of this paper has brought to my notice two facts which may be worthy of mention here. Firstly, it is curious and perhaps significant that of the eight numbers represented by $9{\cdot}1 + 1{\cdot}7n$, where $n = 0, 1, 2 \ldots\ldots 7$, six are epicentre-periods. Secondly, the chance of an earthquake of any one series occurring appears to be unaffected by accidental synchronising. To test this the following table was compiled from the data in Hall's

paper referring to the 700 days from June 1917 :—

Number of quakes due in one day.	Number of days.	Shocks recorded.	Ratio of shocks recorded to shocks due.
0	231	—	—
1	241	49	1·59
2	151	38	1·80
3	58	30	1·58
4	14	9	1·62
5	0	0	—
6	1	0	—

R. A. W.

Official Publication.

Meteorological Office. Geophysical Memoirs. No. 19, Hurricanes and Tropical Revolving Storms. By Mrs. E. V. Newnham, M.Sc. With an Introduction on *The Birth and Death of Cyclones.* By Sir Napier Shaw, F.R.S. Pp. viii + 122. Illus. H.M.S.O., 1922. Price 12s. 6d.

THIS memoir was written as the result of a correspondence between the Secretary of State for the Colonies and the Meteorological Office about a West Indian hurricane occurring in September, 1917, and it was decided that it was desirable to tabulate the available data relating to tropical hurricanes and to discuss the theory of their origin and maintenance. Mrs. Newnham has done her work well, and a most interesting memoir has been produced. Sir Napier Shaw has added a lecture on " The Birth and Death of Cyclones " that he delivered at Bergen on July 22nd, 1920, and some remarks by Dr. Harold Jeffreys on the theory of the subject are included in the text.

Mrs. Newnham's work cannot fail to be of use to those " that go down to the sea in ships and do business in great waters," for it will increase the precision of the rules by means of which a navigating officer is often able to steer his ship so as to escape the dangerous part of the storm. Full details are given of the usual tracks and speed of hurricanes in each of the six zones in one or other of which ninety or more per cent. of them occur.

To meteorologists who are not likely to have close personal acquaintance with these storms the interest lies in their theoretical explanation. We know fairly well the laws, dynamical and thermo-dynamical, which govern the motion of the atmosphere and it is somewhat strange that we cannot form the outline of a theory that will meet with general acceptance. Unequal heating of the earth's surface by solar radiation is undoubtedly the primary cause of all wind, but on the further details we are not agreed. The most generally accepted view

seems to be that the tropical hurricanes are convectional phenomena and Sir Napier Shaw in his lecture supports this idea. He gives strong grounds for his opinion by quoting the usual lapse rate of temperature at Batavia and showing how close it is to conditions that are unstable. Dr. Harold Jeffreys seems to incline to the same view, but less definitely. Mrs. Newnham cites two competent authorities as saying that the tropical storms are shallow, S. M. Ballon giving the height as not usually exceeding 3,000 feet, and Sir J. Elliot as not exceeding 6,000 feet. This appears to be based on the fact that the storms do not seem able to cross a mountain range, but it does not seem to me valid, for equally they nearly always die out over land even though the land is flat. Also they are usually accompanied by an enormous rainfall and such a rainfall could hardly be produced in so shallow a stratum. Sir Napier takes the height to reach up to 15 kilometres. Observations on the altitude of the clouds seen from the central calm might, when it was possible to obtain them, be of use. Possibly the disturbance is much thinner in the central parts than elsewhere. I think there is some evidence that a cyclone in temperate latitudes shows the same tendency. Granting, as seems most likely, that tropical hurricanes are convectional phenomena, it does not follow that the cylcones of temperate latitudes stand on the same footing. The hurricanes are of small diameter and have practically the same conditions as to temperature and humidity all round them; the cyclones may have a diameter of a thousand miles with large differences of temperature on the polar and equatorial sides; also, in the case of the hurricanes it is the centrifugal acceleration that produces the pressure changes, whereas in the cyclones it is the geostrophic effect of the earth's rotation that is most important. The distinction is noteworthy because the one depends on the square of the velocity and the other on the simple velocity.

The distribution of temperature that prevails over a tropical hurricane is unknown and the difficulties of observation appear to be insuperable. The distribution in a European cyclone is well known and it is established beyond dispute that the troposphere is cold, the stratosphere warm, and the tropopause—the boundary between the two—lower than usual. A satisfactory theory must explain these facts. The cold troposphere seems to me to rule out convection completely as the cause of cyclones, and I look upon it as the result of the disturbance, not its cause. The warm stratosphere must be due to the descent of its air; it can hardly be ascribed to radiation because the changes occur too quickly for radiation to have time to act, even if we could find any reason for radiation warming the air

over a cyclonic disturbance more than elsewhere. In the stratosphere the warmer air is found in the higher latitude, but there is no evidence to show that in the higher strata over a cyclone the air has recently come from the north; there is in fact, save near the earth's surface, no correlation between the north-to-south component of the wind and the temperature. My own belief is that the cyclones of temperate latitudes originate in the upper half of the troposphere and are due to a strengthening of the winds in that region which causes a sucking action outwards from the centre. The observed temperature distribution, with the drop of the tropopause, follows naturally in a manner I have set out* elsewhere.

W. H. DINES.

News in Brief.

The subject for the Geophysical Discussion at the Royal Astronomical Society on October 27th was on "The Maintenance of the Earth's Electric Charge." The discussion was opened by Dr. G. C. Simpson, F.R.S.

The following note appeared in the *Daily Chronicle* for September 19th:—"A bottle of rain-water was one of the thank offerings at Chingford Wesleyan Church Harvest Festival."

The *Evening Standard* of July 21st, 1922, reports that "postage stamps that change colour with the weather are worrying the French postal authorities, who have decided that hereafter the intrinsic value of a stamp will be marked plainly in figures.'

A curious accident occurred at the Waterworks at Sheering on May 1st. About 8 p.m. a brilliant flash of lightning was seen and shortly afterwards the main was found to have burst. The lightning had struck a telegraph pole (which stood about a foot from the main), travelled down the conductor and cut a piece of pipe 15 × 3 inches clean out.

The snowstorm of October 29th, 1922, over south-west England was remarkable for the time of year. At Falmouth, snow was falling from noon until 17h. It appears that in the whole history of the observatory, which has been in continuous operation since 1868, there has never before been snow in October, *i.e.*, snow as opposed to mere sleet. Sleet has been logged twice on October 12th, 1887, and on October 29th, 1895.

* *Phil. Trans. Roy. Soc.*, Series A, Vol. 24, p. 276; and *Geophysical Memoirs*, No. 13, p. 70.

The Weather of October, 1922.

At the beginning of the month a considerable belt of high pressure extended from Madeira across France to Scandinavia. On the 5th, however, a shallow depression passed south-eastwards from Ireland to France. The belt of high pressure moved northwards, and by the 7th an anticyclone was centred over Britain. Later it moved east to Scandinavia. Little change then occurred until the 16th, when the centre moved westwards to Iceland. High pressure then persisted in this region until the end of the month, while a series of Atlantic depressions moved eastwards on a track well to the south and crossed the Iberian Peninsula to the Mediterranean. At the same time a second series moved southwards from Spitzbergen across Scandinavia to Central Europe.

Throughout Great Britain the month, as a whole, proved to be remarkably dry, and rainfall totals were in most cases considerably below normal values. The total for the month at Bidston (Liverpool) was but 7 mm., 22 mm. below the previous lowest October total and 70 mm. less than average. Falmouth was 70 mm. below normal and Ross-on-Wye 69 mm. London (Kew observations) measured only 18 mm.—a deficit of 51 mm.

Sunshine, on the other hand, was generally above average, the second week being exceedingly fine, almost continuous records being obtained at English stations on successive days.

The weather on the 1st and 2nd was mild, with south-westerly winds, maximum temperatures in England being rather above normal, while Limoges on the 1st reached 72° F., and Toulouse on the 2nd 75° F. On the third, with the passage of a depression north-eastward, rainfall in Scotland was rather heavy. Aberdeen measured 14 mm. and Castlebay 13 mm.; Limoges and Toulouse were again warm, both stations reaching 77° F. The depression by the 4th had reached the Baltic, Posen recording 17 mm. and Memel 11 mm. A second low on the 4th and 5th gave 23 mm. of rain at Plymouth, 17 mm. at Falmouth, and somewhat smaller amounts at Calais and Brussels. A rise in pressure in the north then ensued and with north-easterly winds, temperatures suffered a decrease. The highest in England on the 6th was 62° F. and readings in France fell generally below 70° F. Gibraltar, however, on the 5th reached 80° F. At this time a vigorous "low" over the eastern Baltic gave rise to a storm during which one of two old Russian warships, while being towed to Germany, broke adrift and became a total wreck near Prangli-saar, Esthonia. Conditions in England from 7th to 9th were drier, little rain beyond east coast drizzle being reported. Further east and south, measurements were however greater, 10 mm. at Lugano (8th) and 9 mm. at Neufahrwasser during a thunderstorm. The same evening, Nice was plunged

into darkness for a quarter of an hour owing to the breakdown of the electric light during a violent storm. The high pressure system to the north then moved eastwards and unsettled conditions set in in Scotland and the north-west. On the 11th 18 mm. of rain were recorded at Jan Mayen, and 13 mm. at Eskdalemuir, while the latter place on the 12th measured 22 mm. At the same time, a " low " over France and Italy gave 30 mm. at Lugano and 10 mm. at Leghorn. Maximum temperature readings in England, with almost continuous sunshine showed a steady rise during the following few days. Llandudno on the 14th reached 70° F. and Colwyn Bay 69° F. Subsequently, with the movement west of the "high," winds again became north-easterly and a decrease in temperature followed. Conditions, however, remained dry, with cloudy skies in the east. The depressions from the north gave rise to considerable rains in southern Poland, causing the flooding of the Oder at Ratiboar. Gales occurred in Norway in the strong polar current at the rear of these cyclones and low temperatures were recorded on the succeeding days. On the 21st Spitzbergen recorded 21° F. at 13h. and snow was reported from mountain stations and at Berlin. With the movement eastwards of depressions across Spain, an unsettled spell began in the Mediterranean. Gibraltar measured 26 mm. on the 22nd, and Geneva, the night following, 22 mm. Taranto experienced 75 mm. on the 25th and the Azores 66 mm.

In the north-west, minimum temperatures showed frost on several nights. On the 25th Renfrew fell to 24° F. and Eskdalemuir to 21° F.; sleet and hail made their appearance on the east coast of Britain, the same morning.

Snow and sleet occurred in the northern parts of the British Isles on the 27th and extended south the following day. London had a slight shower, and a heavy fall occurred in the south-west on the 29th, when a depression over France moving north-east gave rise to gales in the Channel. Weather then improved, the 31st being fine with normal temperatures in England; but a rapid change was occurring and by the evening a large depression off the west of Scotland was giving rise to general south-westerly winds of gale force, accompanied by almost continuous rain in the west and north.

S. F. W.

North Atlantic weather has again been very stormy, and several of the large liners were delayed in consequence. Shipping has also suffered in the bay of Biscay and off the coasts of Brittany. A French fishing boat was driven out into the Atlantic, and the crew were five days without food before being rescued.

On the 18th, the small island of Barbuda, in the West Indies, now a dependency of Antigua, was visited by a severe hurricane, described as the worst within the memory of the inhabitants. No

accounts of this storm have been received from adjacent islands, and details are scanty. It is interesting to note that the maximum frequency of hurricanes in this region occurs in August and September, and that during the period 1876 to 1919 only four hurricanes originated or passed near Barbuda in the month of October. The present storm, following on that of Bermuda, described in last month's issue, seems to indicate an unusually severe season.

It was reported on the 24th that heavy rain in Tangiers had caused the collapse of walls in the native quarter of the town, with casualties. This event was probably the result of a storm, but the mean rainfall for the month is fairly heavy and is given by Hann as 91 mm. (3·6 in.).

The Indian monsoon was weak throughout October, and no cyclone occurred in the bay of Bengal. As a result of heavy rains at the end of September, it was reported on October 3rd by the Government of Bengal that the whole country from Jamalganj, in the Bhogra district, to Santahar, was flooded, houses and cattle being swept away. A later message stated that the loss of life had been relatively small, although 1,500 square miles had been inundated, and a population of a million and a half was involved. The heavy rainfall occurred round the head of the Bay of Bengal, Orissa, Chota Nagpur, and Upper Burma being also affected. A suggestion that floods are on the increase in India owing to railway embankments holding up the water has been denied.

Early in the month a typhoon in the Wenchow district of China (province of Chekiang) caused widespread damage.

Mr. R. C. Mossman reports a severe snowstorm at Puente del Inca, a station in the Andes, in latitude 33° S., at a height of 8,927 feet. The snow, which fell during a severe gale, reached a depth of 4 feet; it is the worst fall of the winter, and is unusual so late in the season. A feature of the winter and spring months (June to October) in the Argentine, has been the unusual rapidity with which cyclonic and anti-cyclonic systems have crossed the country. The Argentine forecasters consider that never since the daily weather charts were instituted in 1902 has the atmospheric circulation been so active.

The special message from Brazil states that the rainfall averaged 40 mm. below normal in the north, but 50 mm. above normal in the central districts. In the south, the rainfall was slightly below normal. Temperature was well below normal in the south and several frosts were recorded. The active circulation associated with high pressure areas, referred to in September, continued during October (see also the message from the Argentine above). On the south coast there were storms on the 6th and the 26th. Crops are generally satisfactory, except that

(*Continued on p.* 294.)

Rainfall Table for October 1922.

STATION.	COUNTY.	Aver. 1881–1915.	1922.		Per cent. of Av.	Max. in 24 hrs.		No. of Rain Days.
		in.	in.	mm.		in.	Date.	
Camden Square	*London*	2·63	1·02	26	39	·28	1	12
Tenterden (View Tower)	*Kent*	3·49	1·81	46	52	·40	4	16
Arundel (Patching Farm)	*Sussex*	3·96	·87	22	22	·55	4	6
Fordingbridge (Oaklands)	*Hampshire*	4·15	1·34	34	32	·59	4	8
Oxford (Magdalen College)	*Oxfordshire*	2·79	·56	14	20	·15	29	12
Wellingborough (Swanspool)	*Northampton*	2·52	·79	20	31	·15	31	13
Hawkedon Rectory	*Suffolk*	2·70	·64	16	24	·21	19	12
Norwich (Eaton)	*Norfolk*	3·12	1·42	36	45	·28	20	16
Launceston (Polapit Tamar)	*Devon*	4·80	1·59	40	33	·47	4	7
Sidmouth (Sidmount)	"	3·72	1·58	40	42	·78	4	8
Ross (County Observatory)	*Herefordshire*	3·28	·55	14	17	·14	31	11
Church Stretton (Wolstaston)	*Shropshire*	3·62	·94	24	26	·34	5	6
Boston (Black Sluice)	*Lincoln*	2·74	1·15	29	42	·14	18,19	19
Worksop (Hodsock Priory)	*Nottingham*	2·63	·75	19	28	·23	19	14
Mickleover (Clyde House)	*Derbyshire*	2·69	·58	15	22	·17	31	12
Southport (Hesketh Park)	*Lancashire*	3·54	·58	15	16	·30	31	6
Wetherby (Ribston Hall)	*York, W. R.*	3·00	1·08	27	36	·24	31	7
Hull (Pearson Park)	" *E. R.*	2·98	2·36	60	79	1·13	5	24
Newcastle (Town Moor)	*North'land*	3·20	1·90	48	59	·36	30	11
Borrowdale (Seathwaite)	*Cumberland*	12·00	4·50	114	38	..	..	..
Cardiff (Ely Pumping Stn.)	*Glamorgan*	4·80	1·73	44	36	·70	31	8
Haverfordwest (Gram. Sch.)	*Pembroke*	5·41	1·41	36	26	1·01	31	5
Aberystwyth (Gogerddan)	*Cardigan*	5·28	·79	20	15	·69	31	2
Llandudno	*Carnarvon*	3·59	·31	8	9	·11	31	7
Dumfries (Cargen)	*Kirkcudbrt.*	4·36	2·38	61	55	·92	31	10
Marchmont House	*Berwick*	3·82	3·44	87	90	·58	5	24
Girvan (Pinmore)	*Ayr*	5·00	1·99	51	40	·46	31	10
Glasgow (Queen's Park)	*Renfrew*	3·25	1·92	49	59	·62	31	9
Islay (Eallabus)	*Argyll*	4·77	2·55	65	53	·66	3	10
Mull (Quinish)	"	5·60	3·77	96	67	·82	3	11
Loch Dhu	*Perth*	7·15	4·50	114	63	1·05	31	8
Dundee (Eastern Necropolis)	*Forfar*	2·66	1·52	39	57	·50	3	14
Braemar (Bank)	*Aberdeen*	3·76	1·56	40	41	·51	3	8
Aberdeen (Cranford)	"	3·25	2·84	72	87	·60	30	23
Gordon Castle	*Moray*	3·16	1·34	34	42	·49	3	15
Fort William (Atholl Bank)	*Inverness*	7·14	4·92	125	69	2·30	31	12
Alness (Ardross Castle)	*Ross*	3·85	2·72	69	71	1·81	31	12
Loch Torridon (Bendamph)	"	8·02	3·35	85	42	1·37	31	11
Stornoway	"	5·18	3·30	84	64	·64	13	19
Loch More (Achfary)	*Sutherland*	7·80	3·98	101	51	·85	13	19
Wick	*Caithness*	2·96	1·53	39	52	·22	31	17
Glanmire (Lota Lodge)	*Cork*	4·15	1·81	46	44	·66	31	10
Killarney (District Asylum)	*Kerry*	5·37	..	..	..	..	..	..
Waterford (Brook Lodge)	*Waterford*	3·91	1·20	31	31	·55	31	8
Nenagh (Castle Lough)	*Tipperary*	3·39	1·07	27	32	·61	31	6
Foynes	*Limerick*	3·71	·60	15	16	·26	31	7
Gorey (Courtown House)	*Wexford*	3·54	1·07	27	30	·40	31	10
Abbey Leix (Blandsfort)	*Queen's Co.*	3·52	1·01	26	29	·34	31	10
Dublin (FitzWilliam Square)	*Dublin*	2·68	·86	22	32	·14	5	14
Mullingar (Belvedere)	*Westmeath*	3·12	..	..	..	..	..	..
Crossmolina (Enniscoe)	*Mayo*	5·18	..	..	..	..	..	..
Collooney (Markree Obsy.)	*Sligo*	4·11	1·93	49	47	·80	11	9
Seaforde	*Down*	3·56	1·73	44	49	·64	11	9
Ballymena (Harryville)	*Antrim*	3·69	1·77	45	48	·64	11	11
Omagh (Edenfel)	*Tyrone*	3·67	2·01	51	55	·81	11	11
Letterkenny Asylum	*Donegal*	4·20	1·29	33	31	·30	11,31	12

Supplementary Rainfall, October 1922.

Div.	STATION.	RAIN. in.	RAIN. mm.	Div.	STATION.	RAIN. in.	RAIN. mm.
II.	Ramsgate	2·78	71	XII.	Langholm, Drove Rd.	2·98	76
,,	Sevenoaks, Speldhurst	1·43	36	XIII.	Ettrick Manse	3·96	101
,,	Hailsham Vicarage	1·15	29	,,	North Berwick Res.	1·95	49
,,	Totland Bay, Aston Ho.	1·22	31	,,	Edinburgh, Royal Ob.	1·67	43
,,	Ashley, Old Manor Ho.	..	..	XIV.	Biggar	1·90	48
,,	Grayshott	1·14	29	,,	Leadhills	4·11	104
,,	Ufton Nervet	·84	21	,,	Kilmarnock, Agric.Coll.	2·59	66
III.	Harrow Weald, Hill Ho.	·83	21	XV.	Dougarie Lodge	2·81	71
,,	Pitsford, Sedgebrook	·69	17	,,	Oban	3·76	95
,,	Chatteris, The Priory	·44	11	,,	Holy Loch, Ardnadam	..	..
IV.	Elsenham, Gaunts End	·60	15	,,	Tiree, Cornaigmore	..	..
,,	Lexden, Hill House	·85	22	XVI.	Loch Venachar	3·40	86
,,	Aylsham, Rippon Hall	1·51	38	,,	Glenquey Reservoir	3·60	91
,,	Swaffham	·70	18	,,	Loch Rannoch, Dall	2·02	51
V.	Devizes, Highclere	1·28	33	,,	Blair Castle Gardens	1·15	29
,,	Weymouth	1·77	45	,,	Coupar Angus	1·39	35
,,	Ashburton, Druid Ho.	2·01	51	,,	Montrose Asylum	1·42	36
,,	Cullompton	1·25	32	XVII.	Logie Coldstone, School	1·52	39
,,	Hartland Abbey	1·64	42	,,	Fyvie Castle	2·16	55
,,	Penzance, Morrab Gden.	2·38	60	,,	Grantown-on-Spey	2·06	52
,,	St. Austell, Trevarna.	1·52	39	XVIII.	Kingussie, Fasnakyle	1·78	45
,,	Crewkerne Merefield Ho	1·71	43	,,	Fort Augustus	2·71	69
VI.	Clifton College	1·46	37	,,	Loch Quoich, Loan	6·90	175
,,	Ledbury, Underdown.	·43	11	,,	Fortrose	1·51	38
,,	Shifnal, Hatton Grange	·61	15	,,	Faire-na-Squir	3·76	95
,,	Ashbourne, Mayfield.	·53	13	,,	Skye, Dunvegan	3·74	95
,,	Barnt Green, Upwood	·32	8	XIX.	Loch Carron, Plockton.	2·64	67
,,	Blockley, Upton Wold	·61	15	,,	Dornoch, St. Gilbert's	·96	24
VII.	Leicester, Town Hall Sq	·61	15	,,	Tongue Manse	2·39	61
,,	Grantham, Saltersford	1·58	40	,,	Melvich Schoolhouse	1·33	34
,,	Louth, Westgate	1·77	45	XX.	Dunmanway Rectory	3·07	78
,,	Mansfield, West Bank	1·06	27	,,	Mitchelstown Castle	..	..
VIII.	Nantwich, Dorfold Hall	·44	11	,,	Gearahameen	1·00	25
,,	Bolton, Queen's Park.	·58	15	,,	Darrynane Abbey	..	..
,,	Lancaster, Strathspey.	·90	23	,,	Cashel, Ballinamona	1·26	32
IX.	Wath-upon-Dearne	·98	25	,,	Roscrea, Timoney Park	·82	21
,,	Bradford, Lister Park.	·88	22	,,	Broadford, Hurdlestown	1·31	33
,,	West Witton	1·22	31	XXI.	Kilkenny Castle	·86	22
,,	Scarborough, Scalby	1·88	48	,,	Rathnew, Clonmannon	1·21	31
,,	Middlesbro', Albert Pk.	1·42	36	,,	Hacketstown Rectory	1·29	33
,,	Mickleton	..	..	,,	Balbriggan, Ardgillan	1·28	33
X.	Bellingham	1·54	39	,,	Drogheda	1·41	36
,,	Ilderton, Lilburn	2·88	73	,,	Athlone, Twyford	..	..
,,	Orton	2·40	61	XXII.	Castle Forbes Gdns.	1·65	42
XI.	Llanfrechfa Grange	1·85	47	,,	Ballynahinch Castle	..	..
,,	Treherbert, Tyn-y-waun	3·06	78	,,	Galway, Grammar Sch.	1·37	35
,,	Carmarthen Friary	1·65	42	XXIII.	Westport House	1·83	47
,,	Lampeter, Falcondale	1·33	34	,,	Enniskillen, Portora	1·41	36
,,	Cray Station	2·80	71	,,	Crossdoney, Kevit Cas.	1·78	45
,,	B'ham W.W., Tyrmynd	1·74	44	,,	Armagh Observatory	1·27	32
,,	Lake Vyrnwy	2·24	57	,,	Warrenpoint	1·97	50
,,	Llangynhafal, P. Drâw	·66	17	,,	Belfast, Cave Hill Rd.	1·97	50
,,	Oakley Quarries	1·40	36	,,	Glenarm Castle	1·36	35
,,	Dolgelly, Bryntirion	1·69	43	,,	Londonderry, Creggan.	1·40	36
,,	Snowdon L., Llydaw 9	6·55	166	,,	Sion Mills	1·64	42
,,	Lligwy	·88	22	,,	Milford, The Manse	1·52	39
XII.	Stoneykirk, Ardwell Ho	2·20	56	,,	Narin, Kiltoorish	2·79	71
,,	Carsphairn, Shiel	4·03	102	,,	Killybegs, Rockmount	2·37	60

Climatological Table for th

STATIONS	PRESSURE		TEMPERATURE							
			Absolute				Mean Values			
	Mean M.S.L.	Diff. from Normal	Max.	Date	Min.	Date	Max.	Min.	½ max. and min.	Diff. from Norm
	mb.	mb.	°F.		°F.		°F.	°F.	°F.	°F.
London, Kew Observatory	1020·0	+4·1	87	24	35	13	68·0	47·2	57·6	+4
Gibraltar	1017·1	+2·2	80	27	48	1	72·3	59·5	65·9	+0
Malta	1018·2	+4·5	80	27	52	4	71·7	61·5	66·6	+1
Sierra Leone	1012·2	+0·5	91	4,14,30	71	8,23,27	88·2	74·6	81·4	−0
Lagos, Nigeria	1010·2	−0·8	91	3	71	15	87·7	75·6	81·7	+0
Kaduna, Nigeria	1012·3	−0·8	96	4, 15	65	25, 27, 31	90·2	70·5	80·3	+1
Zomba, Nyasaland	1015·6	+1·3	88	1	49	25	73·8	58·9	66·3	+0
Salisbury, Rhodesia	1015·4	−2·7	83	12, 16	42	23	75·8	49·2	62·5	+2
Cape Town	1019·9	+2·0	89	7	41	16	70·1	50·5	60·3	+1
Johannesburg	1021·6	+0·9	69	27	31	15	63·3	42·7	53·0	−1
Mauritius	..	..	..	..	..	..	..	..	..	..
Bloemfontein	..	..	73	24	23	17	65·7	36·9	51·3	−1
Calcutta, Alipore Obsy.	1003·6	+0·1	102	25	71	3, 8	97·1	78·7	87·9	+1
Bombay	1007·1	−0·6	94	1	78	9	92·1	81·3	86·7	+1
Madras	1005·7	+0·3	110	4	74	31	99·0	80·8	89·9	0
Colombo, Ceylon	1009·7	+1·5	91	5	70	9	87·6	76·8	82·2	−0
Hong Kong	1008·3	−1·1	89	30	71	4	83·3	75·4	79·3	+1
Sandakan	..	..	91	12, 14	74	8,21,31	88·5	76·1	82·3	−0
Sydney	1019·3	+0·7	75	4	47	28	67·1	53·2	60·1	+1
Melbourne	1020·3	+0·8	78	1	35	29	61·8	47·4	54·6	+0
Adelaide	1020·8	+0·7	79	1	41	29	65·8	51·2	58·5	+0
Perth, Western Australia	1019·6	+0·8	79	11	43	22	68·7	50·5	59·6	−0
Coolgardie	1020·1	+0·3	81	12	34	25	67·6	45·3	56·5	−1
Brisbane	1017·0	−1·8	87	5	47	28	75·2	55·9	65·5	+1
Hobart, Tasmania	1017·7	+2·1	70	1	38	27	59·0	45·3	52·1	+1
Wellington, N.Z.	1020·1	+4·9	66	13	32	31	59·7	45·2	52·5	−0
Suva, Fiji	1012·1	−0·7	86	27	60	4	82·1	67·0	74·5	−2
Kingston, Jamaica	1013·0	−0·3	91	6	70	3	88·1	72·9	80·5	+0
Grenada, W.I.	1014·4	+1·8	86	8, 9, 18	72	1	84·1	74·2	79·1	−0
Toronto	1015·3	+0·5	80	31	35	1	70·5	48·8	59·7	+7
Winnipeg	1011·9	−2·4	83	26, 27	33	30	71·7	48·4	60·1	+8
St. John, N.B.	1015·3	+1·3	75	29	33	1, 5	58·5	41·3	49·9	+2
Victoria, B.C.	1018·8	+2·4	84	31	35	9	60·8	45·4	53·1	0

LONDON, KEW OBSERVATORY.—Prevailing wind direction south-westerly, mean sp 6·9 mi/hr, 2 days with hail, 3 days with thunder heard.

GIBRALTAR.—Prevailing wind direction E, 1 day with hail, 1 day with fog, 1 day with g

MALTA.—Prevailing wind direction north-westerly, 1 day with hail, 2 days with thun heard.

SIERRA LEONE.—Calms predominate. 8 days with tornado, 4 days with thunder heard

LAGOS.—Prevailing wind direction S.W.

SALISBURY, RHODESIA.—Prevailing wind direction easterly, 2 days with thunder heard

LAGOS, NIGERIA :—										
Feb. 1922 - -	1008·6	−1·5	91	16	74	2, 22	88·9	77·5	83·2	+1
Mar. 1922 - -	1008·5	−0·9	92	13	72	22	90·0	78·5	84·3	+1
KADUNA, NIGERIA -										
Jan. 1922 - -	1014·2	+2·6	93	8	56	13, 25	88·3	60·2	74·3	0

LAGOS.—From April the hours of observation change from 9 h. to 9h. 45 m. and 15 h. 15 m
Prevailing wind direction : Feb. westerly, Mar. westerly.

British Empire, May 1922.

TEMPERATURE				PRECIPITATION				BRIGHT SUNSHINE		STATIONS
Mean	Absolute	Relative Humidity	Mean Cloud Am'nt	Amount		Diff. from Normal	Days	Hours per day	Percentage of possible	
Wet Bulb. °F.	Min. on Grass °F.	%	0–10	in.	mm.	mm.				
53·4	24	63	4·4	1·02	26	− 18	7	9·4	60	London, Kew Observatory.
59·4	45	71	4·4	0·45	11	− 34	4	..	..	Gibraltar.
60·2	48	69	3·3	0·37	9	− 1	2	10·0	71	Malta.
75·9	..	72	5·3	3·82	97	−186	16	..	..	Sierra Leone.
77·9	69	77	7·9	8·13	207	− 56	18	..	..	Lagos, Nigeria.
71·2	..	69	1·0	4·06	103	− 83	9	..	..	Kaduna, Nigeria.
..	..	80	4·8	0·68	17	− 8	9	..	..	Zomba, Nyasaland.
54·3	..	56	3·0	0·90	23	+ 11	4	..	..	Salisbury, Rhodesia.
54·5	..	64	3·7	1·71	43	− 58	9	..	..	Cape Town.
42·6	30	58	4·6	0·94	24	+ 6	3	8·5	79	Johannesburg.
..	..	..	..	..	..	..	..	..	..	Mauritius.
40·3	..	56	1·2	0·80	20	− 10	2	..	..	Bloemfontein.
80·4	68	53	2·8	2·47	63	− 83	5*	..	..	Calcutta, Alipore Obsy.
78·4	68	66	2·3	0·00	0	− 18	0*	..	..	Bombay.
78·3	73	61	3·6	1·18	30	+ 3	4*	..	..	Madras.
78·4	70	73	8·2	22·66	576	+265	26	..	..	Colombo, Ceylon.
75·2	..	85	7·9	5·50	140	−157	21	5·7	43	Hong Kong.
77·9	..	83	..	7·11	181	+ 29	6	..	..	Sandakan.
55·8	39	71	5·7	3·69	94	− 38	14	4·4	42	Sydney.
51·7	35	76	6·2	2·69	68	+ 13	14	..	..	Melbourne.
53·5	33	71	6·6	3·36	85	+ 16	18	3·9	38	Adelaide.
54·7	34	66	4·2	6·37	162	+ 43	13	6·9	66	Perth, Western Australia.
51·8	31	52	3·9	0·77	20	− 15	6	..	..	Coolgardie.
60·3	42	63	3·5	2·04	52	− 23	10	..	..	Brisbane.
48·2	34	76	6·2	0·62	16	− 31	12	4·8	49	Hobart, Tasmania.
49·1	20	79	6·4	1·23	31	− 89	12	3·9	40	Wellington, N.Z.
73·5	..	87	6·4	8·42	214	− 44	18	..	..	Suva, Fiji.
..	..	73	5·9	0·28	7	−103	5	..	..	Kingston, Jamaica.
73·7	..	75	4·9	1·29	33	− 85	17	..	..	Grenada, W.I.
52·6	29	67	4·4	1·46	37	− 39	9	..	..	Toronto.
54·8	..	70	4·2	2·65	67	+ 10	12	..	..	Winnipeg.
44·7	31	73	5·6	2·63	67	− 27	11	..	..	St. John, N.B.
47·1	27	70	5·2	0·49	12	− 21	8	..	..	Victoria, B.C.

* For Indian stations a rain day is a day on which 0·1 in. (2·5 mm.) or more rain has fallen.

COLOMBO, CEYLON.—Prevailing wind direction SW, mean speed 5·9 mi/hr. 8 days with thunder heard.

HONG KONG.—Prevailing wind direction ESE, mean speed 12·4 mi/hr, 8 days with thunder heard.

SANDAKAN.—Prevailing wind direction NE.

PERTH, W.A.—Mean speed of wind 9·0 mi/hr.

WELLINGTON, N.Z.—Wind direction variable, 1 day with fog.

SUVA, FIJI.—Wind direction variable.

GRENADA.—Prevailing wind direction E., 1 day with thunder heard.

76·6	..	84	8·8	0·81	21	− 30	2	..	..	LAGOS, NIGERIA :— Feb. 1922.
78·1	..	80	8·9	1·50	38	− 58	7	..	..	Mar. 1922.
61·5	..	62	1·0	0·00	0	0	0	..	..	KADUNA, NIGERIA :— Jan. 1922.

KADUNA.—Records for February and March unreliable.

(*Continued from p.* 289.)

in the south vines were killed by the late frosts. At Rio de Janeiro, pressure during October was equal to the average but temperature was about 1° F. below normal.

Rainfall in the British Isles.

The rainfall of the month was practically everywhere below the average, an extremely rare occurrence in the British Isles. The deficiency was most marked in the centre of England and Wales, where less than a quarter of the average was recorded over a very large area. Less than a quarter of the average fell in places on the west coast of Ireland. As little as 10 per cent. of the average was recorded in the Cheshire plain, where, at Wallasey, only ·025 in. (0·6 mm.) was recorded from the 6th to 30th, a period of 25 days. In England, Wales and Ireland only small areas had rainfall above half the average. These areas included the east of Kent, where slightly more than the average was recorded locally, the extreme north-east of England and part of the north of Ireland. By far the greater part of the centre and east of Scotland had more than half the average. On parts of the east coast more than 75 per cent. of the average was recorded.

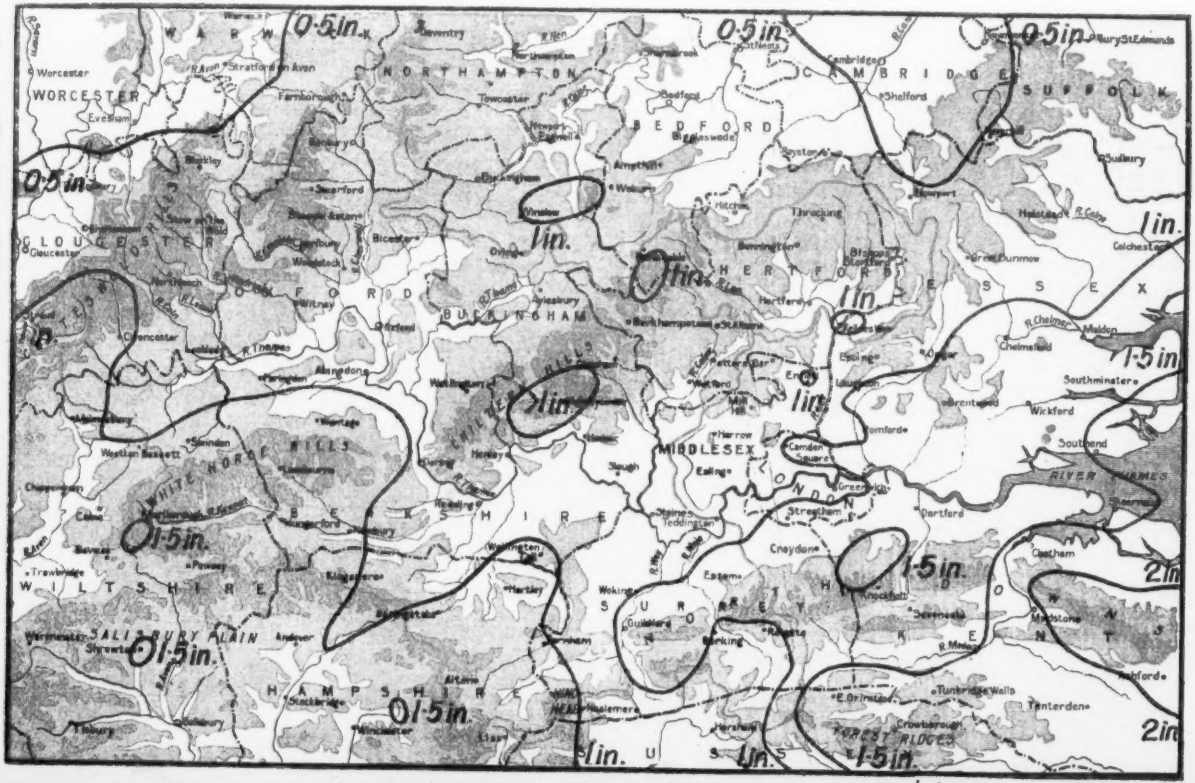
Areas with a total rainfall of less than 25 mm. (1 in.) were unusually widespread, including a large portion of the centre of England, stretching from Worthing in the south to Lancaster and York in the north, and from the Welsh border in the west to Ipswich and the Wash in the east. Less than 25 mm. also occurred in the neighbourhood of Dublin and in parts of the southern centre of Ireland. Totals of more than 75 mm. (3 in.) were much less widespread than usual, being, as a rule, local and confined to the high lands of England and Wales, and the west and south-west of Ireland. In Scotland falls of 75 mm. or more fell generally in the west.

The driest Octobers since 1865 were those of 1879, 1888, 1897 and 1904. In the two driest Octobers on record, in 1879 and 1904, the heaviest rainfall relative to the average fell in the north-west, but in 1922 the heaviest rain fell in east and centre of Scotland and along the east coast generally. So far as it is possible to see at present, October, 1922, was probably as dry over the country as a whole as any October of which we have any record.

The general rainfall, expressed as a percentage of the average, was: England and Wales, 33; Scotland, 59; Ireland, 37; British Isles, 42.

In London, Camden Square, the mean temperature for October was 48·1° F., or 2·1° F. below the average. Duration of rainfall, 21·3 hours. Evaporation, 0·66 inch.

THAMES VALLEY RAINFALL —— OCTOBER, 1922.



ALTITUDE SCALE

Below 250 feet	
250 to 500 feet	
500 to 1000 feet	
Over 1000 feet	

SCALE OF MILES

Published at Kew Thames above Teddington, and River Lee above Feildes Weir.

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